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Man, Medicine and Ecology

An Overview

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BY TRADITION, philosophy and training, physicians have had as their principal concern the care of sick human beings. The great challenge of medicine has been to find ways to save human lives, to make and keep people healthy, and to prolong human life. Armed with modern technology, physicians have been meeting that challenge with ever-increasing success. Modern medicine has succeeded in controlling, avoiding and even eliminating diseases. It has developed extraordinary surgical techniques, including procedures to transplant vital organs. Medicine is responsible for vastly reduced infant mortality, for far less incidence of death in childbirth, and for the addition of decades to the life expectancy of millions of people. From the conquest of infectious disease to triumphs in the understanding of metabolism and endocrinology to breaking the genetic code the train of brilliant medical successes rolls on.

Implicit in medicine's achievements has been the basic concept that man is a separate entity, a little apart from and a little above other forms of life. Ideally he might live longer and more healthfully if he could be spared from the natural elements. A few years ago a leading woman's magazine proposed rearing infants in a totally aseptic, air-conditioned, temperature-controlled environment, sealed off from possible contamination by disease and fed carefully programmed foods supplemented by the proper minerals and synthetic vitamins. Indeed medicine has considered the natural environment per se as important only when it became obvious that it was directly affecting the health of man. So that while physicians accepted occupational diseases such as silicosis as being environmentally caused, and recognized that filth was a dangerous vector for many infectious diseases and that Anopheles mosquitoes bred in marshes, the broader importance of ecology and the role of the total environment in its subtle as well as direct impact upon man has largely escaped medical attention.

Today, however, physicians—like the rest of mankind—must become uneasy. Despite medicine's great successes in identifying, isolating and attacking disease, in fostering human longevity, in providing in fact the finest health care man has ever known, something has gone terribly wrong. The most well-fed, well-cared-for and affluent society in history shows serious signs of sickness. It is in great danger. There is an alarming amount of mental illness, an increasing crime and suicide rate, a frightening drug problem, a major disaffection of youth and near-pathological hatred between races and between the sexes. In spite of great expertise in sanitation—and an understanding of its prime health role—man has polluted every major lake, stream and ocean on earth and is continuing to do so. A recent report from the Department of Health, Education and Welfare rated 41 percent of pub-

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lic water supply systems in the United States as substandard. It is increasingly hard to find clean fresh air to breathe anywhere—even 30,000 feet high in the sky. With all its good work, good ideas and good intentions, modern medicine is not meeting some of mankind's most critical health problems. Doctors, charged with the care and welfare of people, must begin to look beyond traditional medicine if they are to meet the growing challenge of their charge.

We suggest that they must look first to ecology. Along with all people, they must recognize that the environment is more than just a background for human activity; it is man's life-support system and ultimately, the basis of his very survival. The natural laws that govern all life upon the planet are just as important to man as they are to some of the wildlife now obviously threatened with extinction. An understanding of these laws and their relationship to human life must become a prime concern of the good physician if he is to help man survive.

The fundamental importance of ecology to medicine—and the terrible price that must be paid when it is ignored—is being thrust upon physicians in three different and highly disturbing ways. First of all, we are seeing today a tremendous increase in the kinds and numbers of diseases and deaths which are brought about directly by pollution and poisoning of man's environment. This is far more than a simple increase in occupational disease: new and lethal agents are abroad.[1,2] Pesticides (or, more properly, "biocides," as Garrett Hardin[3] defines them), household poisons such as carbon tetrachloride, polychlorinated biphenyls used in industry, organomercurials—all these may become major causes of disability and death. According to Rudd,[1] organomercurials used in industry and agriculture not only cause death but congenital neurological injuries, since they can penetrate the placental barrier. DDT is now present in human mother's milk in concentration considered illegal for animal milk by the U.S. Food and Drug Administration.

Disease and death caused by air pollution is no longer news. Goldsmith[2] documents community air pollution as the new airborne disease of our generation. It is caused by the increasing use of fuel, associated with both affluence and careless waste. The known and suggestive effects of photochemical pollution are widespread. Aggravation of asthma and of chronic respiratory diseases such as emphysema and chronic bronchitis, impairment of pulmonary function and of visibility, eye symptoms and plant damage have been documented. More subtle effects include impairment of oxygen transport by the blood due to carbon monoxide and interference with porphyrin metabolism due to lead.

Further provocative research by Winkelstein and French[4] suggests that many other deaths from diseases, hitherto thought unrelated, may in fact be linked to polluted air.

On a second level, we know that medicine is inadvertently responsible for new disease conditions because of its innocent and well-meaning manipulation of the environment. Audy[5] catalogues numerous instances of this and lists several groups of iatrogenic diseases. Iatrogenesis has become a new dimension in the causation

A Working Guest

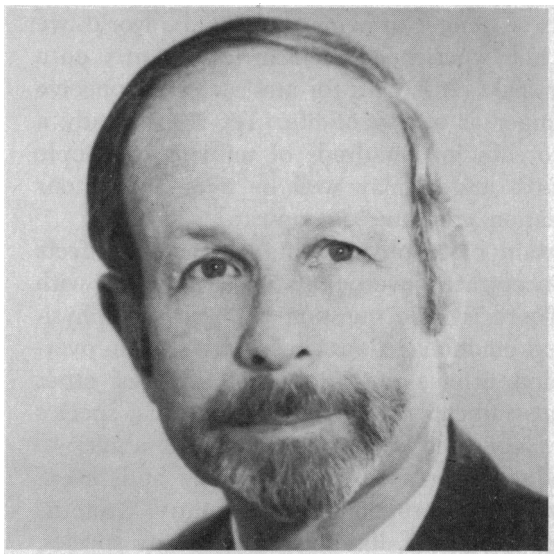
Long before ecology became a household word and the environment was considered apart from heredity, Edgar Wayburn was deeply concerned with enhancing the quality of human life.

A native of Macon, Georgia, and an honor graduate of Harvard Medical School, he served his residency in internal medicine at New York's Columbia-Presbyterian Medical Center. He chose California for his home and place of practice in the 1930's largely because of its natural beauty. Returning to medical practice in San Francisco after service overseas with the Air Force in World War II, he was appalled to see the beginning—and accelerating—deterioration of the California landscape. He became increasingly concerned at what was happening to the land, the lakes and rivers, the mountains, and the last remaining unspoiled wild places in the west and, indeed, in all the United States.

In the late '40's he became active locally in the Sierra Club. Then in 1953, he took the presidency of the Federation of Western Outdoor Clubs, initiating his avocation of volunteer leadership in the national conservation effort. In 1955 he became chairman of the national Conservation Committee of the Sierra Club and in 1957 he was elected a director of the club. From 1961 to 1964 he served his first stint as Sierra Club president, following this with a second term from 1967 to 1969. He is currently vice-president of the club in charge of its parks and wilderness program. During Dr. Wayburn's leadership with the Sierra Club in the past decade, the club's membership has grown from 17,000 to nearly 110,000—at a rate far faster than the population of the State of California—and the club's concerns have broadened to include man's total environment.

Dr. Wayburn has personally led many Sierra Club conservation campaigns, from the effort to enlarge Mt. Tamalpais State Park (almost in his own backyard) to the successful fight to establish a Redwood National Park, a project which he initiated and spearheaded. He has also pioneered in recognizing and defining the broad scope of ecological and environmental concern. During the past several years he has had numerous of his conservation writings (published frequently in the Sierra Club Bulletin, often in co-authorship with his wife, Peggy) reprinted in the national media—from the San Francisco *Examiner* to *The Wall Street Journal*. He has contributed both photographs and text to Sierra Club publications, his latest being in *The Last Redwoods* and *The Parkland of Redwood Creek* published in 1969. He has also appeared frequently on television and radio as a conservation spokesman. He has received many conservation awards including the American Motors Conservation Award (given to ten outstanding conservationists each year), the California Conservation Council's award and Marin County's KTIM award.

Dr. Wayburn has combined the active practice of medicine with his deep conservation commitment. He has also taken part in many medical and community affairs. He is Associate Clinical Professor of Medicine at the University of California, San Francisco, School of Medicine and adjunct Associate Clinical Professor at Stanford as well as Chief of the Endocrine and Diabetes Clinic at Pacific Medical Center. He served on the board of directors of the San Francisco Medical Society from 1957 to 1965 and was president of the society in 1965. He has been on the Editorial Board of California Medicine since 1949 and a member of the House of Delegates of the California Medical Association since 1958, serving on numerous committees. He is on the boards of directors of the Garden Hospital-Sullivan Rehabilitation Center, the San Francisco Diabetes Association, Headlands, Inc., Open Space Action, the Sierra Club and the Sierra Club Foundation. He is an active outdoorsman, skier, hiker and mountaineer, and leader of Sierra Club outings.



Remarkable for his vision and involvement as well as his breadth of interests (he has been called a true Renaissance Man) Dr. Wayburn is uniquely qualified to serve as Guest Editor for this pioneering issue of ***California Medicine,*** the first such issue of a state or general medical journal to devote itself to the intimately connected subjects of Man, Medicine and Ecology.

of human disease.[6] The antimicrobial agents, while curing infection, can at the same time provide the opportunity for new infections to develop. With the exception of surgical excision, almost all of the methods used in the specific treatment of cancer (radiation, chemotherapy) are also capable of inducing cancer in humans or animals under appropriate conditions.

But perhaps most serious of all, it is evident that medicine is directly responsible for some of the enormous human problems now facing mankind. Medicine, in fact, epitomizes the ecological dilemma confronting people everywhere. By considering man apart from his natural environment, by tampering with and attempting to control certain fundamental ecological laws for the sake of man alone, medicine may well be hastening man's death rather than increasing his long term chances for survival.

A paramount example is the fact of human overpopulation on the planet earth. Kingsley Davis[7] documents the increase in human population both in percentage and absolute rise from prehistoric times to the present. He dramatizes his facts by pointing out that the gain in the 20-year period from 1950 to 1970 exceeds the gain made in 170 years between 1750 and 1920 and it exceeds the gain made in some 400,000 years before 1820. Some demographers estimate that over half the people who have ever lived are alive at this time — and the outlook for increasing our human population within decades is staggering.

Modern medicine through its highly effective death control—without compensating birth control—has been a major factor in the rapid increase of earth's overall population, a point discussed at some length by both Davis and Hardin in this symposium. Overpopulation is already with us, yet we are only beginning to

realize the implications of what overpopulation means. Familiar as we are with the traditional effects of hunger in many parts of the world, we have not experienced them in this country on a major scale. It is hard for most of us to conceive of hunger as a way of life. Yet it is already a way of life for hundreds of millions of people on earth and it may well be ours, too, if our population continues its upward spiral.

Certain more obvious and portentous effects of concentrated overpopulation are clearly with us. There is little question of increasing physical and emotional illness being manifest in overcrowded urban communities. Studies of other animals indicate that overcrowding of a species causes aberrant behavior, diminished ability to reproduce, increased homosexuality and, eventually, self-destruction.[8] Too many humans crowded together, like too many of any species, may create a condition intolerable to nature. Ecology tells us that our planet has a limited carrying-capacity for human life (even as has a space ship, to use an analogy that is apt although well worn). Yet for all our profound medical research, we have hardly begun to study this most elemental of biotic problems.

Other side effects of medical achievements are posing alarming ecological problems. Medicine's use of pesticides (biocides) for short-term disease control is contributing to long-term problems whose significance can only be guessed at. For instance, the wholesale use of chlorinated hydrocarbons in malaria control has helped set loose an immeasurable quantity of uncontrollable and lethal stuff into the global food chain. Certain species of animals, particularly the raptors, are already threatened with extinction as a result. Man himself does not appear to have suffered large scale direct ill effects—yet. But the medical scientist must be concerned and alarmed that the indiscriminate broadcasting of persistent poisons has launched highly unscientific experiments upon the whole earth.

Other instances where medicine has tampered with ecology in a potentially dangerous manner are mentioned by Audy:[5] In Sarawak recently, spraying (for malaria) led to "biological magnification" or concentration of DDT through food chains. Cats died after eating DDT-loaded wall-geckoes and cockroaches; the rats then multiplied until there were threats of plague. Replacement cats finally had to be parachuted into the villages to keep down the rats . . . Disrupting states of immunity can also upset natural balance. Paralytic poliomyelitis may reappear after sanitation has progressed far enough to interrupt transmission of innumerable small immunizing doses, thus allowing children to grow up susceptible.

The "tampering with ecology" in which medicine has perhaps the greatest responsibility is concerned with the evolution of man. Davis[7] points out that the human species is fast climbing out on an evolutionary limb. Increasingly, human survival is achieved by means that release rather than intensify genetic selection. By rescuing the diseased and imperfect of the human species—one of our most compassionate objectives—and by making it possible for the genetically less fit to propagate, medicine is increasingly making the "survival of the fittest" an academic and obsolete concept for the human race. (Through "predator" control, incidentally, humans are also doing the same for many other species.) We are denying, indeed defying, the basis of evolution—which we accept and teach our children.

On the positive side, medicine can learn much from the recognition and understanding of the importance of ecology as a broad science. The science of ecology studies and relates the interlocking and interacting components of biological systems. Medicine is one of the most important of all those components. By treating medicine as a broad factor in human survival, by enlarging its concepts to include public health on the wide, long-term scale, the role of medicine in ecology can assume an even more important status. Medicine, we suggest, must move beyond single-minded consideration of the individual patient as its only objective to a consideration of humanity as a whole: as Audy states, we must concentrate on health rather than on sickness. Where we have been treating symptoms of ecological disease—as in attempting to alleviate emphysema—we must attack the disease itself and help clean up the air people breathe. There is a great opportunity for medicine to expand its own vision and its own role in human survival.

The use of ecology in medicine may prove practical in other aspects also: the study of the effects of chemicals in wild species may well serve as an "early warning system" for human beings, as

Rudd[1] suggests, and the health of "the canary," Goldman[9] points out, may prove to be of utmost importance to the health of all us "miners" (assuming, of course, that the canary still sings).

The specific application of the role of ecology in the promotion of health, as well as in the causation of disease, is brought out well by Winkelstein and French.[4] Disease care, per se, may not be the most effective agent in promoting public health: we may need to explore environmental factors on a much more comprehensive scale. We may well get more from our health dollars if we put them into research on important ecosystems which affect man (and all ecosystems do, sooner or later). Study of the effects of human crowding, of massive air pollution, of overurbanization represents legitimate medical investigation, and of a kind which is in fact long overdue. Such study should take its place by the side of medical study of advanced aspects of specific diseases.

Man generally has used up heedlessly and freely the natural world as his population requirements of the moment needed fulfillment. In retrospect, we can look back to the poor conservation practices of a comparatively small population in ancient historical times and recognize that logging the forests of Lebanon and overgrazing the grasslands of Judea were dominant factors in the disappearance of the culture of that day. Nevertheless in modern, affluent, populous America we have in large part failed to think and do enough about the destruction of our own forests and the degradation of our own soil. The reservation of watersheds has become important only when accomplished damage is too obvious. We have not yet recognized that perpetuation of a primeval coastal redwood forest may be more valuable to man for its ecological as well as its spiritual and recreational values than as a ten-year lumber supply.

Man as the careless exploiter of the natural world is now rapidly outgrowing the only home he knows, the planet earth. He must accept and implement the concept of rational limitation of the use of his resources rather than the heedless exploitation of them. Medicine, we suggest, must take its place in this new philosophy.

In fact, we submit that medicine faces a whole new challenge in coming to understand the role of the environment as a part of man and the role of man as a part of the environment. To help define that challenge and document it, an unconventional complex of articles has been brought together here in this professional medical journal. The essays are at once iconoclastic and rational. They have been prepared in part by experts in fields outside of medicine, yet there is great relevance to medicine in the various disciplines represented here, even as there was relevance to medicine in the work of the non-physician Pasteur. The series has deliberately not placed emphasis on the problems of "occupational health," since we believe that this is a field already recognized and well-explored. It touches only lightly on the agricultural uses of poisons and inorganic fertilizers, on solid waste disposal, on drugs, and on the accidental and suicidal contact of people with toxic materials. Other aspects of ecology and medicine which we consider to be of great importance—such as radioactivity—are not included. Our limitation is space and time: it is hoped that perhaps both may be found in the future. Meanwhile, we offer this series as a catalyst.

It is a hard fact that no one of the articles in this series is remotely cheerful: each presents evidence of an impending—or current—ecological catastrophe which may ultimately threaten mankind. Yet the articles were selected not for their doomsday prophesies nor for their indictment of our way of life which is responsible for so many of our ills. (Indeed, as Hardin[3] points out so well, each one of us is as guilty as the next in this respect.) A major purpose is to offer suggestions for ways to a more insurable future, and each of our authors has done so either specifically or by inference.

An overview of the series prompts one solemn and over-riding question: Can we and will we accept the suggested cures for our ecological dilemma? Can mankind make the sociological changes, the adjustments, the sacrifices necessary to his enlightened self-interest in survival? Can we rescue, restore or preserve the blue skies, clear waters and green forests that are man's natural and supportive heritage and that are his hope for a future quality existence? Indeed, to put it bluntly, will we make it?

We believe that we can. We believe further that medicine with its traditional ideal of service to mankind should be a natural leader in the overall fight for man's survival. Therefore this series is offered not only as a beginning chal-

lenge to greater medico-ecological understanding, but as a strong call to action in a new dimension of medical effort. It will not be easy to change the habits ingrained in man through the millenia, the very traits which have given him dominion over the earth's resources and brought him to the brink of ecological disaster. Nor will it be easy to change our own traditional medical way of thinking in terms of individual diseases and cures. But to the classical four horsemen of Revelation another must be added and recognized by us all—one representing the careless wanton destruction of man's only home, the earth he lives upon. And to the physician's understanding of the role and treatment of disease must be added the realization that man must live in harmony with the earth if he is to live at all.

Paradoxically, perhaps, the best prospect for humanity may lie in the limitation of man's numbers as well as in the elimination of his illnesses: in the perpetuation of his natural environment as well as in the intelligent and civilized use of it. Medicine is properly concerned with both. An understanding of the implications of death-control demands an understanding of the implications of birth-control. The healing physician may take his place beside the enlightened ecologist and find himself arguing even louder for the protection of wild places, for the preservation of ecosystems unaltered by man's technology and unspoiled by man.

Sometime, around 400 A.D. Hippocrates, writing on *Airs, Waters, and Places,*[4] uncovered an edge of the fundamental ecological truths we are articulating today. We must accept and unstand them well. Unless we do so, medicine and man himself may become, in the most literal sense of the words, academic subjects.

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